EFFECTS OF E-LEARNING ON STUDENTS ACHIEVEMENT AND INTEREST IN SCIENCE AND TECHNOLOGY

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Abstract

The purpose of this study was to examine the effects of E-learning on Junior Secondary School student's achievement and interest in science and technology. Two research questions were posed and two hypotheses formulated to guide the study. Quasi-experimental (Non-equivalent control group design) was used for the study, which was carried out in Minna Education Zone of Niger State. The sample used for the study was two hundred and seven (207) male and female JSC1 students randomly selected from one intact class each of the four coeducational schools in Minna through balloting. The instruments used for the study were the Achievement Test on Science and Technology (ATST) and Interest Inventory on Science and Technology (IIST). Two lesson plans and a marking guide were developed for the study. The test items, lesson plans and marking guide were all validated by experts in Science and Technology education. The inter-rater reliability coefficient of the ATST was found to be 0.96, while the internal consistency was found to be 0.80. Also, the coefficient of stability for the ATST and the IIST were found to be 0.91 and 0.92 respectively.Means and Standard deviations were used to answer the research questions, while the Analysis of Covariance (ANCOVA) was adopted in testing the hypotheses at P≤0.05 probability level. The findings of the study showed that students taught Science and Technology using the e-Learning strategy achieved significantly higher than those taught science and technology using the conventional strategy. Alsothe interest of students taught science and technology using the e-Learning strategy improved significantly than those taught using the conventional teaching method. Based on the findings of this study, it was recommended that serving teachers be trained in current innovative teaching-learning

strategies such as e-learning strategy through workshops, seminars, conferences and in-service programmes. Enough classroom practice activities should be given to students regularly during lesson, to enhance their mastery of the content being taught.

Keywords: *e-learning, achievement, interest, science and technology.*

Introduction

For any nation to attain sustainable development, there is need to recognize science and technology education as a priority area for her citizens. No country can be globally recognized without talking about its scientific advancements.

Correa, Rabello, & Okada, (2014),views science and technology as an act of doing which is more concerned with various investigative processes and activities with regards to developing, acquiring and controlling knowledge, skills, capacity and attitude about the natural factors of the environment. This implies that science and technology is a way of knowing the facts and theories among others.

Science and technology education is described by Tekinarslan, Gurer and Agca, (2013), as a process of teaching or training, especially in school to improve one's knowledge about environment and to develop one's skill of systematic inquiry as well as natural attitudinal characteristics. Science and technology education has been recognized worldwide as a pre-requisite in technological development.

E-learning presents an entirely new learning environment for students, thus requiring a different skill set to be successful (Tseng, Wu and Hwang, 2010) Critical thinking, research, and evaluation skills are growing in importance as students have increasing volumes of information from a variety of sources to sort through (Ali, 2011).Also, particularly in courses that are entirely electronic, students are much more independent than in the traditional setting. This requires that they are highly motivated and committed to learning (Tekinarslan, Gurer and Agca, 2013). They have less social interaction with peers or an instructor. Students in online courses tend to do as well as those in conventional classrooms, but there is higher incidence of withdrawal or incomplete grades (Bell, Urhahne, Schanze, &Ploetzner, 2010).

E-learning can be viewed as computer assisted learning, and as pedagogy for student-centered and collaborative learning. Early developments in e-learning focused

on computer assisted learning, where part or all of the learning content is delivered digitally. More recently, the pedagogical dimension of e-learning has become prominent. E-learning comprises all forms of electronically supported learning and teaching. The information and communicationsystems, whether networked learning or not, serve as specific media to implement the learning process.

The International Labor Organization defines the requirements for education and training in the new global economy simply as "basic education for all", core work skills for all and "lifelong learning for all". Information and communication technologies (e-learning) which include radio and television, as well as newer digital technologies such as computers and the Internet have been touted as potentially powerful, enabling tools for educational change and reform. "When used appropriately, different e-learning are said to help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping to make teaching and learning an engaging, active process connected to real life"Junqi, Yumei and Zhibin, (2010). The characteristics of the e- learning strategy aroused interest in this study to determine the effect of e-learning on achievement and interest in science and technology.

Purpose of the Study

The purpose of this study was to explore the effect of E-learning on students' achievement and interest in science and technology. Specifically, the study determined the effect of e-learning strategies on;

1. the achievement of students in science and technology.
2. students' interest in science and technology.

Research Questions

The following Research Questions guided the study:

1. What are the mean achievement scores of students taught science and technology using e-learning strategy and those taught by the conventional approach?
2. What are the mean interest scores of students taught science and technology using the e-Learning strategy and those taught using the conventional approach?

Hypotheses

The following hypotheses were formulated and tested at$P \leq 0.05$.

1. There is no significant difference in the mean achievement scores of students

taught science and technology using the e-learning strategy and those taught using the conventional approach.

2. There is no significant difference in the mean interest scores of students taught Science and Technology using the e-learning strategy and those taught using the conventional approach.

Research Method

The design of this study was quasi-experimental. Specifically, the non-equivalent control group design was adopted for the study. It makes use of randomly selected groups instead of randomly composed samples used in true experiments.This study was conducted in Minna Education zone of Niger state, Nigeria. The population of the study was 6,152 JSC 1 students of 2016/17 academic session from schools in Minna Education zone of Niger state. The students comprised 3,255 males and 2,897 females.The sample of the study was two hundred and seven (207) male and female students in the intact classes of JSCII randomly selected for the study.Two experts in Science and Technology Education validated the instruments. The pre-test was administered to the students in all the groups before the commencement of the experiment without any feedback on the test being given to the students. After scoring; students' scores were recorded and kept aside by the researchers for use after the experiment. After teaching, the post-test were administered to all the groups. Data from the posttest were recorded separately. The ATST and RTST were scored out of a maximum of 50 marks, that was 5 marks for each question and a minimum mark of zero (0) using the marking scheme, while the IIST were scored out of a maximum of 100 and a minimum of 25.Data collected using the instruments were analyzed with respect to the research questions posed and the hypotheses formulated for the study. Means and Standard Deviations of achievement scores of students were used in answering the Research Questions, while the Analysis of covariance (ANCOVA) was used to test the hypotheses formulated for the study at $P \leq 0.05$ probability level.

Results

Research Question I

What are the mean achievement scores of students taught science and technology using e-learning strategy and those taught by the conventional teaching approach?

Table 1: Mean Achievement and Standard Deviation Scores of Students in Experimental and Control groups

		Pretest	Posttest
Experimental	N	105	105
	Mean	10.0857	31.8095
	Std. Deviation	1.93209	6.81217
Control	N	102	102
	Mean	9.5471	18.9510
	Std. Deviation	1.89003	7.31522

Table 1 shows the mean achievement scores and standard deviation of students in both the experimental and control groups' pretest and posttest. The mean PRE-ATS t- scores of the experimental and control groups are 10.0857 and 9.5471, with a standard deviation of 1.93209 and 1.89003respectively. The mean POST-ATS t-Scores of the experimental and control groups are 31.8095 and 18.9510, with a standard deviation of 6.81217 and 7.31522 respectively.

Research Question 2

What are the mean interest scores and standard deviations of students taught science and technology using e-learning strategy and those taught by the conventional teaching approach?

Table 3: Mean Interest Scores and Standard Deviations of Students in the Experimental and Control Groups

Group		Pre- IIS	Post-IIS
Experimental	N	105	105
	Mean	1.6037	3.5840
	Std. Deviation	.11304	.10116
Control	N	102	102
	Mean	1.5414	2.9384
	Std. Deviation	.11831	.34181

From Table 3, the mean PRE-IIS t-scores of the experimental and control groups are 1.6037 and 1.5414 with a standard deviation of 0.11304 and 0.11831 respectively. The mean POST-IIS t-scores of the

experimental and control groups are 3.5840 and 2.9384 with a standard deviation of 0 .10116 and 0 .34181 respectively. The mean scores of the experimental group was higher than that of the control group.

Hypothesis 1

There is no significant difference in the mean achievement scores of students taught science and technology using e-learning strategy and those taught by the conventional teaching approach.

Hypothesis 1 was tested at P ≤ 0.05 level of significance using Analysis of Covariance (ANCOVA). The result is shown on table 2.

Table 2: Analysis of Covariance of Students' Scores in the Experimental and Control Groups' Achievement Test in Science and Technology Due to Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1802.154	2	901.077	18.013	.000
Intercept	126545.459	1	126545.459	2529.766	.000
Pretest	26.336	1	26.336	.526	.469
Group	1782.335	1	1782.335	35.631	.000
Error	10204.610	204	50.023		
Total	185167.000	207			
Corrected Total	12006.763	206			

Table 2 shows that the p value of the significance of F (35.631) on achievement is 0.000 compared to P ≤ 0.05 alpha level already set. The null hypothesis of no significant difference in the mean achievement scores of students taught Science and Technology using the e-Learning strategy and those taught using the conventional approach is therefore rejected. Hence, there is a significant difference in the mean achievement scores of JSSII students taught science and technology using the e-learning strategy and those taught using the conventional teaching strategy in favour of the e-learning group.

Hypothesis 2

There is no significant difference in the mean interest scores of students taught Science and Technology using e-Learning

strategy and those taught by the conventional teaching approach.

This hypothesis was tested using ANCOVA at $p \leq 0.05$ level of significance as shown in table 4.

Table 4: Analysis of Covariance of Students' Scores in the Experimental and Control Groups' Interest Inventory in Science and Technology Due to Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	21.572	2	10.786	171.168	.000
Intercept	11.070	1	11.070	175.664	.000
PreInterest	.010	1	.010	.154	.695
Group	19.864	1	19.864	315.229	.000
Error	12.855	204	.063		
Total	2242.302	207			
Corrected Total	34.428	206			

Table 4 shows that the p value of the significance of F (315.229) on interest is 0 .000 compared to P≤ 0.05 level of significance already set. Therefore the null hypothesis of no significant difference in interest scores between the experimental and control group is rejected. Hence, there is a significant difference in the mean interest scores of students taught science and technology using the e-learning and those taught using the conventional strategy in favour of the e-learning group.

Discussion of findings

The results of this study showed that the use of e-learning in the teaching of science and technology enhanced the performance of the students. This was proved by the difference in the scores of the control and experimental groups with the latter group performing significantly better. This findings is in line with Kroop, Mikroyannidis, &Wolpers (2015) and Okada (2007), who observed that e-learning ensures students motivation and differentiates between students capability level. Also, the study carried out by Chiu, Kuo, Huang, & Chen (2008), showed that students taught with new technologies did not regret on outcome assessments. He further asserted that when new technologies are integrated into teaching and learning, there is greater student's engagement in

learning and greater engagement equals to higher achievements.

The experimental group mean score on interest was higher than that of the control group. The findings of this study is in line with the results of Ogbuanya and Hassan (2010), which found that the experimental group obtain higher interest mean score than the control. There was significant difference in the mean scores of the subjects on interest. This finding is in line with the results of Hassan (2016), which found significant difference in the mean interest scores of the experimental and control groups in favour of the experimental group.

Conclusion

The following conclusions are made based on the results of the study.

1. The use of the e-learning strategy significantly improved students' achievement in science and technology than the use of the conventional mastery teaching-learning approach.
2. Students' interest in science and technology content taught using the e-learning strategy was better enhanced than those of their counterpart taught using the conventional mastery teaching-learning approach.

Recommendations

Based on the findings of the study, the following recommendations are made.

1. Teachers who are already in the field should be trained in current innovative teaching–learning strategies such as the e-learning strategy through workshops, seminars, conferences and in-service programmes by science and technology educators, ministries and agencies in-charge of education, professional bodies such as Science Teachers Association of Nigeria (STAN), Nigeria Association of Teachers of Technology (NATT) and Curriculum Organization of Nigeria (CON). This is to enable them update their knowledge on current teaching strategies that are found effective in teaching science and technology content.
2. Teachers should give students enough practice activities during science and technology lessons, to enhance their mastery of the content being taught. Such practice activities should be properly supervised by the teachers so that it does not become business as usual for the students. Students should be guided in areas of their difficulty by teachers so that they can overcome any anxiety that might arise in this regard. The e-

learning strategy is a step in the right direction for such guidance, since it incorporates a step- by-step teaching and learning procedure in its activities.

3. Classroom teaching and learning activities should be reviewed by the curriculum developers to include the varieties of teaching strategies that were proved effective through research, in the teaching of science and technology contents. In this way teachers will be discouraged from using the conventional approaches to teaching in the classrooms. Students should take their practice activities seriously to enable them master sincerely the science and technology content taught.
4. Educational institutions teaching science and technology should make provision for well equipped computer laboratory with internet facilities for teaching and learning.

References

Ali, A. (2011). Key factors for determining students' satisfaction in distance learning courses: A study of Allamalqbal Open University. *Contemporary Educational Technology, 2*(2), 118–134.

Bell, T., Urhahne, D., Schanze, S., &Ploetzner, R. (2010). Collaborative inquiry learning: Models, tools, and challenges. *International Journal of Science Education,* 3(1), 349–377

Chiu, P.S., Kuo, Y., Huang,Y. & Chen. T. (2008). A Meaningful Learning based u-Learning Evaluation Model, Eighth IEEE International Conference on Advanced Learning Technologies, pp. 77 – 81.

Correa, A. L., Rabello, C., & Okada, A. (2014).*Reliability of web-based information in inquiryprojects.*Paper presented at the EC-TEL 2014 9th European Conference on Technology Enhanced Learning, Graz, Austria.

Hassan, A.M. (2016) Effects of Challenged-Based and Activity-Based Learning Approaches on Techical College Student's Achievement, Interest and Retention in Woodwork Technology. (*Unpublished Ph.D. Thesis*), University of Nigeria Nsukka.

Junqi, W., Yumei, L. & Zhibin, L. (2010). "Study of Instructional design in Ubiquitous Learning" in *Second International Workshop on Education Technology and Computer*

Science, pp.518-523. *Technologies*, pp. 726-727.

Kroop, S., Mikroyannidis, A., &Wolpers, M. (2015). *Responsive open learning environments*. New York: Springer.

Ogbuanya, T.C. & Hassan, A.M.(2010) Effect of e-learning on the achievement of students in Basic Technology, *Journal of Science, Technology and Mathematics Education* (JOSTMED) 7 (1) 74-78

Okada, A. (2007). Knowledge media technologies for open learning in online communities. *The International Journal of Technology, knowledge& Society, 3*, 61-74.

Tankeleviciene, L. &Damasevicius,R. (2009), Towards a Conceptual Model of Learning Context in E-learning, *Ninth IEEE International Conference on Advanced Learning Technologie, 2009 -ICALT 2009*, July, 2009, Riga, Latvia, pp. 645 – 646